CLAIMS

1. A method of fabricating a membrane electrode assembly for use in a fuel cell, including the steps of:
   (A) providing a mold that includes a first and second mold plate adapted to impart a desired shape;
   (B) providing a lead frame, including at least a first lead frame component that is adapted to be received into said mold;
   (C) assembling a protonically conductive membrane with catalyst coatings on each of its major surfaces onto said first lead frame component;
   (D) placing said lead frame containing said membrane into the mold;
   (E) compressing said second mold plate onto said first mold plate;
   (F) introducing a moldable material in communication with said mold plates;; and
   (G) allowing the moldable material to cure in said mold to solidify and form a frame around said membrane to produce a membrane electrode assembly for use in a fuel cell.

2. The method as defined in claim 1 including the further step of integrating a current collector into said first lead frame component onto which said membrane is placed.

3. The method as defined in claim 2 including the further steps of:
   (A) providing a second lead frame component that includes a second current collector; and
   (B) sandwiching said catalyzed membrane between the first and second current collectors;
   (C) introducing the lead frame components into said mold;
   (D) compressing the first and second mold plates together;

(E) introducing a moldable material into said mold;

(F) allowing the moldable material to cure to form the shape of the mold plates thereby forming a sealed fuel cell.

4. The method as defined in claim 1 wherein the step of introducing the moldable material includes injection molding a moldable material into said mold.

5. The method as defined in claim 1 wherein the step of introducing the moldable material includes placing said moldable material onto said mold plates and casting a frame around the membrane electrode assembly.

6. A method of fabricating a fuel cell array, including the steps of:

(A) providing a mold that includes a first and second mold plate of a desired shape;

(B) providing a sheet of protonically conductive membrane material that has been coated on each of its major surfaces with a catalyst material to form a sheet of catalyzed membrane;

(C) providing a lead frame structure that includes a plurality of individual lead frame components that define separate fuel cells;

(D) assembling said sheet of catalyzed membrane into said lead frame structure;

(E) placing said lead frame structure containing said membrane sheet into the mold;

(F) compressing said second mold plate onto said first mold plate ;

(G) introducing a moldable material in communication with said mold plates; and

(H) allowing the plastic to cure in said mold to solidify and form a frame around said individual fuel cells to produce a fuel cell array.

7. A method of establishing a seal around a fuel cell, comprising the steps of:

(A)providing a lead frame assembly including:

(i) providing first and second current collectors adapted to serve as lead frame components in an associated mold device;

(ii) assembling fuel cell components including:

(a) a catalyzed protonically conductive, electronically non-conductive membrane; and

(b) first and second diffusion layers disposed on opposite sides of said membrane;

(iii) arranging said fuel cell components between said first and second current collectors;

(B) inserting the resulting lead frame assembly into a molding device;

(C) introducing a moldable material into said molding device; and

(D) allowing said moldable material to cure to seal the edges of the lead frame assembly against leaks to thereby seal the fuel cell.

8. The method as defined in claim 7 comprising the further step of spot welding the first and second current collectors that serve as lead frame components together to maintain the components in place.

9. The method as defined in claim 7 including the further step of trimming excess lead frame component portions away from said fuel cell to result in a finished fuel cell.

10. The method as defined in claim 7 including the further step of providing said mold device with a mold cavity which, when said moldable material is introduced into said mold cavity and cured, creates a frame around said fuel cell.

11. A method of establishing a sealed diffusion layer for use in a fuel cell including the steps of:

(A) providing a first current collector integrated into a lead frame component;

(B) applying a diffusion layer material to said first current collector on said lead frame component;

(C) providing a second current collector integrated into a lead frame component;

(D) applying a second diffusion layer material to said second current collector on said lead frame component;

(E) placing a catalyzed protonically conductive, electronically non-conductive membrane between said first lead frame component and said second lead frame component to form an assembly;

(F) placing said assembly into a molding device;

(G) closing mold plates associated with said molding device and hot pressing the assembly for a predetermined time period;

(H) introducing a moldable material into said mold cavity of said mold device; and

(I) allowing said moldable material to cure to seal said lead frame components integrating said first and second current collectors together to form a fuel cell.

12. The method as defined in claim 11 wherein step (H) includes an insert molding technique.

13. The method as defined in claim 11 including the further step of spot welding said first and second lead frame components together to maintain said components in position prior to placing the assembly into the molding device.

14. A method of introducing compression into a fuel cell, comprising the steps of:

(A) providing a catalyst coated membrane;

(B) providing a first current collector integrated into a first lead frame component suitable for being received into a molding device;

(C) providing a second current collector integrated into a second lead frame component suitable for being received into a molding device;

(D) assembling said first and second current collectors on either side of said membrane to result in an assembly;

(E) placing said assembly into said mold device that has been provided with mold plates;

(F) closing said mold plates and maintaining said mold plates in a closed position to induce compression; and

(G) introducing a moldable material into the resulting mold cavity thereby creating a frame around the fuel cell that maintains compression within said fuel cell without the need for mechanical fasteners.

15. A fuel cell manufactured by the steps of:

(A) providing a lead frame assembly including:

(i) providing first and second current collectors adapted to serve as lead frame components in an associated mold device;

(ii) assembling fuel cell components including:

(a) a catalyzed protonically conductive, electronically non-conductive membrane; and

(b) first and second diffusion layers disposed on opposite sides of said membrane;

(iii) arranging said fuel cell components between said first and second current collectors;

(B) inserting said lead frame assembly into an insert molding device;

(C) introducing a moldable material into said insert molding device; and

(D) allowing said moldable material to cure to seal the edges of the lead frame assembly against leaks to thereby form a sealed fuel cell.

16. A component for use in a direct oxidation fuel cell comprising:

(A) a conductive material suitable for use as a current collector;

(B) a second material applied to said conductive material, which second material acts as a diffusion layer in a fuel cell; and

(C) a lead frame structure disposed around said current collector material for handling said component during a molding process.

17. The component as defined in claim 16 wherein a plurality of apertures are disposed within said current collector for plastic flow through during an insert molding process.

18. A direct oxidation fuel cell comprising:

(A) a catalyzed membrane electrolyte;

(B) an anode current collector disposed generally parallel to an anode aspect of said catalyzed membrane electrolyte, said anode current collector including an anode diffusion layer material that has been hot pressed to seal said diffusion layer material onto said current collector; and

(C) a cathode current collector disposed generally parallel to a cathode aspect of said membrane electrolyte, a cathode diffusion layer material having been hot pressed onto said cathode current collector to seal it against leakages; and

(D) disposing said catalyzed membrane between said anode current collector and said cathode current collector, a load connected across said anode current collector and said cathode current collector to utilize the electricity produced in reactions generated when a fuel substance and oxygen are introduced.

19. The direct oxidation fuel cell as defined in claim 18 wherein said anode current collector includes pores sized in such a manner that the anode current collector functions as a diffusion layer.

20. The direct oxidation fuel cell as defined in claim 18 wherein said cathode current collector includes pores sized in such a manner that the cathode current collector functions as a diffusion layer.

21. The fuel cell as defined in claim 18 wherein said anode current collector includes channels therein such that said anode current collector also functions as a flow field plate.

22. The fuel cell as defined in claim 18 wherein said cathode current collector includes channels such that said cathode current collector functions as a flow field plate.